"Breed Out the Unfit and Breed In the Fit"

Irving Fisher, Economics, and the Science of Heredity

By Annie L. Cot*

Abstract. Fisher's virulent positions on such themes as "race degeneration", the necessity of sterilization measures for certain categories of the American population, and his urgent call for the control of the genetic quality of new immigrants are hardly consistent with the opalescent subtlety of academic disputes over the nature of capital and interest. Although Fisher repeats it often: in his work, this question of the nature of capital and interest is directly linked to eugenic assumptions and analysis. This second body of Fisherian work illuminates the strong epistemological and theoretical references in Fisher's work as an economist. This paper addresses this question through three major themes: the constant denunciation of a «racial decay» of the American population and its corollary: the project of setting up a «scientific humaniculture»; the plea against the eugenic effects of World War I, and the then haunting question of the closing of the «Golden Door».

There is now no reasonable excuse for refusing to face the fact that nothing but a eugenic religion can save our civilization from the fate that has overtaken all previous civilizations.

—George Bernard Shaw

Not only is it in the end more economical to attempt an effort to breed out the disabilities of the human race, but it means a more

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permanent realization and the elevation of humanity to a higher plane.

—Irving Fisher (1915e: 175)

A particle *in Mechanics* corresponds to an individual *in Economics*. Space *in Mechanics* corresponds to Commodity *in Economics*. Force *in Mechanics* corresponds to marginal utility or disutility *in Economics*. Work *in Mechanics* corresponds to disutility *in Economics*. Energy *in Mechanics* corresponds to utility *in Economics*. (Fisher [1892] 1997: 129; emphasis in original)

Mechanical analogies.[1] Historiography indeed remembers Irving Fisher's first, and fundamental, contribution to American mathematical economics as being rooted in this table of correspondences. Never had analogies between mechanics and economic theory been taken as far as in his *Mathematical Investigations in the Theory of Value and Price*, where equations, correlations, and theorems are borrowed from mid-19th century physics.

Looking back at these early professional years, Fisher insisted on this inaugural matrix: "I was a student of mathematical physics and, with youthful enthusiasm, dreamed dreams of seeing economics, or one branch of it, grow into a true science by the same methods which had long since built up physics into a true and majestic science" (1933: 2).[2] In a 1946 address to the Irving Fisher Foundation: "I entered economics from the standpoint of the mathematical sciences, having been a pupil, and later a colleague, in the mathematical department at Yale University of the famous physicist Professor J. Willard Gibbs, often called 'the American Sir Isaac Newton.'"[3]

At that time, Fisher considered that economics could not turn into a science if it did not adopt the schemes of the domain that had made the best use of mathematical tools—mechanics: "The difficulties encountered in getting most professed economists to adopt the methods of physical science made me nearly despair of ever living to see economics become a science in the sense that physics is a science" (1933: 3). Thus his many direct transfers of concepts, methods,[4] and even experimental mechanisms[5] from the field of physics into the field of pure economic theory.

Fisher's sources for metaphors were not limited to mechanics, however. Many other images would turn up in his early writings,

borrowed from biology or medicine. "I feel most earnestly the truth of this idea," he confided to Will Elliot in 1895, "that social science is very immature and that it will be a long time before it reaches the 'therapeutic' stage, that the efforts of philanthropists to treat of therapeutics too soon, both delays the solid progress of the humbler preliminary stages of the anatomy and physiology of society and is more likely to lead to evil than good."[6]

A few years later, Fisher moved toward a more radical position, as his repeated calls for such "therapeutic efforts" led him to superimpose other references, borrowed from Darwinian biology, to his basic mechanical model—to the point where he proposed to shift scientific expertise on social matters from economics to eugenics and to consider the "science of heredity" as a universal matrix for all social sciences, including economic theory.

As well as Willard Gibbs, William Graham Sumner was a major influence during Fisher's formative years—a "revered master" Fisher claimed in his presidential address to the American Economic Association. Sumner was a fierce defender of social Darwinism and of free trade and, for this reason, was the only major economist who stayed out of the American Economic Association at its launching in 1885.

> My interest in economics was then chiefly an interest in William Graham Sumner, the leading American economist and a most picturesque personality. Sumner so fascinated me that I found myself spending a great deal of time with his department, entirely outside of my chosen sphere of mathematics. (Fisher 1941: 185)

It was Sumner who suggested that Fisher write his dissertation in mathematical economics.[7] It was Sumner who was to be the dedicatee of *The Nature of Capital and Income*. It was Sumner who introduced him to Darwin and to recent Darwinian literature. But whereas Sumner's Darwinism sought to defend a fundamental laissez faire, both in the field of economics and in the field of population, Fisher rapidly endorsed a harsh interventionist position on the latter. The turning point can be dated between 1898 and 1901, while Fisher was being treated for tuberculosis, a period, he would later write, that "greatly changed [his] point of view from that of an academic student of supply and demand as a mathematical problem, to that of a partaker in public movements for the betterment of mankind" ([1892] 1997: 8).

A "partaker in public movements for the betterment of mankind": there was to be much of this in Fisher's career.[8] But the most active of these involvements, as well as the most productive as far as published material is concerned, was evidently his engagement with the American eugenics movement.[9] "Perhaps I'm a Don Quixote but I'm trying to be a Paul Revere," he wrote to his wife in 1924. "First the tuberculosis fight, then hygiene in general and the Life Extension Institute, and now the Eugenics and Peace movements have appealed to me. It's not the conventional college professor's attitude and it's just because others are not seeing these big things that I am championing them. . . . I do want before I die to leave behind me something more than a book on Index Numbers . . . *I feel as though I have found a niche in making application of my scientific training.*"[10]

For more than 25 years, Fisher thus led a double career as a university professor of political economy at Yale and as an active campaigner for the American eugenics movement, where he engaged intensively, chaired meetings, organized committees, gave interviews, spoke at conferences, wrote dozens of articles, and published books and reports. This important corpus is far from being exhaustively explored.

The edition, edited by William J. Barber, of *The Works of Irving Fisher*, *Volume 13: A Crusader for Social Causes*, has the double merit of at last recognizing the existence of this double career (although in a sometimes rather mitigated version) and giving some important excerpts from it.[11] The first contact with these texts might be surprising: Fisher's virulent positions on such themes as "race deterioration," the necessity of sterilization measures for certain categories of the American population, or his advocacy for an urgent control of the genetic quality of new immigrants have some exalted accents, inconsistent with the opalescent subtlety of his academic disputes over the nature of capital and interest.

Fisher repeated over and over that, to him, the question of the nature of capital and interest was directly linked to precise eugenic assumptions on the nature of economic agents. The "crusades" corpus therefore not only enlightens us as to Fisher's curiously rather marginal situation in the academic world of his time, but it also informs us about a permanent strong biological reference in Fisher's

theoretical work in economics[12] (see Cot 1989, 2004). This was common to many American economists at the turn of the century, and, unlike the Gilded Age Spencerian reference, was rooted in the radically nonliberal reading of Darwin developed in England a few years before by Darwin's cousin, the statistician Francis Galton.

I

Paul Revere or Don Quixote?

DISTANT ADHERENCE TO EUGENICS was a quite common feature among American academics around the turn of the century: Charles W. Eliot, president of Harvard University, Henry F. Osborn, paleontologist and director of the American Museum of Natural History, and Edward L. Thorndike, the Columbia University psychologist, for example, signed many calls in favor of eugenics measures.[13] Other signatures came from economists such as Francis Amasa Walker, Richmond Mayo Smith, Jeremiah Jenks, John R. Commons, Walter Willcox, Carlos Closson, Henry Pratt Fairchild, Thomas N. Carver, Prescott F. Hall, and Frank A. Fetter, who all signified their approval of eugenic theories and propaganda at one point or another in their careers.

But none of them could rival Fisher, whose struggles in the ranks of the eugenic movement were lifelong. In 1907, under the sponsorship of the American Society for the Advancement of Science, he organized and chaired a Committee of One Hundred on National Health, designed to lobby in favor of federal interventions on matters of public health and eugenics.[14] This position helped him become a member of the National Conservation Commission, set up by U.S. President Theodore Roosevelt, where Fisher prepared the final report, *National Vitality, Its Waste and Conservation*, assigning a central position to eugenics.[15] One year later, in 1909, he met geneticist Charles Benedict Davenport, a central figure in the early American eugenics movement[16] and director of the Station for the Experimental Study of Evolution at Cold Spring Harbor, Long Island, with whom he would closely collaborate in the coming years. In this year Fisher also joined the Executive Committee of the National Committee for Mental Hygiene, which was devoted to promoting eugenics as a method to prevent and cure the nation's feebleminded and mentally ill.[17] In 1910,

Davenport organized a Eugenics Record Office[18] on Long Island, whose official mission was to gather "data on the inheritable traits of American families, and to give advice to individuals on marriage and to states on defective communities."[19] Fisher supported the project and subsequently got involved with an intense institutional activity within it. "There is no subject outside of my own field in which I am more deeply interested," he wrote to Davenport in 1911, in the enthusiasm of the preparations for the first International Eugenics Congress, to be held in London, "and [I] only wish I had time enough to go into it thoroughly."[20] He also was active in helping the foundations of the Gaylord Farm Tuberculosis Sanatorium in Wallingford, Connecticut, and the National Tuberculosis Association.

In 1914, he was among the founders of the "Life Extension Institute," whose purpose, according to its Membership Pledge, was "to reduce life-waste and to guard and strengthen the vitality and vigor of our race" (Fisher [1915d] 1997: 80). After World War I, he organized and chaired the Committee of Sixty (in favor of Prohibition) and was designated president of the Sub-Committee on Alcohol of the Council of National Defense. He served as president of the Board of Scientific Directors for the Eugenics Record Office at Cold Spring Harbor,[21] having written a few years earlier to Davenport: "I almost wish I were doing the very kind of work you are doing there; for it is surely the greatest work in the world today."[22] Two years later, he chaired the important Ad Interim Committee of the American eugenics movement, which had been created in 1915 in New York on the occasion of the Second International Eugenics Congress. In collaboration with John Harvey Kellogg and Charles Davenport, he played a decisive role in setting down the Race Betterment Foundation at Battle Creek, Michigan[23] and, in 1921, he served as president of the Eugenics Research Association. As chairman of the Eugenics Committee of the United States of America—with Davenport acting as vice-chairman—he organized and chaired the Committee on Selective Immigration. He helped create the National Committee for Mental Hygiene, designed to get rid of the "congenitally defective," and chaired the Eugenics Research Institute. In 1925, he played a central role in setting up the American Eugenics Society, becoming its first president (with, again, Davenport acting as vice-president), and its "driving force."[24]

All these functions were evidently much more than honorific: as Mark Haller wrote in 1963, Fisher played the role of a "guiding genius" within a great number of institutions designed to promote American eugenic propaganda.[25]

II

A "Scientific Humaniculture"

FISHER'S DEFINITION OF EUGENICS was of strict Galtonian obedience. "First of all, what is eugenics?" he asked in his article "Impending Problems of Eugenics." "Eugenics, as the Greek derivation of the word shows, means the science of right breeding. The word was invented by Sir Francis Galton, of England, to express his ideal of founding a world movement to improve the human race. . . . Eugenics is simply an application of modern science to improve the human race" ([1916] 1997: 161–162).[26]

"A scientific humaniculture," is what Fisher wrote about a few years later ([1921] 1997: 195). Quite common at the beginning of the 20th century,[27] this metaphor presupposes some rather heroic assumptions. First is the appropriateness of the analogy between stockbreeding and human reproduction. "There is every reason to believe that human beings are as amenable to cultivation as other animals or plants," wrote Fisher in his report on *National Vitality* ([1909] 1976: 677).[28] Second is the supposition that the characters of "inferiority" and "superiority" of some individuals could be objectively ascertained. Third is the assumption that the factors responsible for this distinction are hereditary rather than environmental. And fourth, breaking with any sort of laissez faire, is "the proposition that the beneficial action of natural selection had been replaced by social mechanisms facilitating the propagation of inferior specimens."[29]

Whereas in his first texts on mathematical economics Fisher advocated in favor of tooling economic theory with concepts and measures strictly borrowed from classical physics, from 1906 on, this new corpus brings about a threefold methodological shift in his theoretical writings:

1. A shift in epistemological criteria from the strictly analytical and deductive rules used in mathematics and mechanics to the Galtonian and Pearsonian definition of an instrumental science, "harnessed" with

applied reforms. The point is of some importance. For Fisher, eugenics was a science, not a classification or a taxonomy[30]—and as a science, it can be compared with economics. "I will here only observe that classification has never been an efficient instrument of scientific analysis," he wrote in the *Economic Journal*. "It comes forward in what Bacon called systems or pseudo-sciences. Physical science among the Greeks was classificatory; modern physics is analytic. The former was barren, the latter is progressive. . . . 'Natural history' gained little from drawing the distinction between plants and animals. It began, to be a science when Darwin introduced the abstract ideas of variation, heredity and selection" (1897: 213). It was hence on this basis that this "science" of eugenics could be developed as an "instrument" both of social expertise and of social reform. "Formerly I used to dislike the very word 'propaganda', and the idea still more," Fisher later acknowledged to Charles Davenport. "Now I have come to believe as Karl Pearson . . . has said in his *Grammar of Science* that 'science can justify itself to the world only by being harnessed up with the world' or words to that effect, and it seems to me that every practical man, whether his tastes are naturally academic or scientific, or otherwise, must recognize the need of some machinery for so harnessing up scientific work."[31] A few years later, in his presidential address to the Eugenics Research Association, Fisher went even further:

> My main thought is that there is now a golden opportunity for eugenists to "gear in", so to speak, with the great world of events. It was the dream of Galton that eugenics should not forever remain academic, but that, being the vital concern of us all, it should become a sort of religion. ([1921] 1997: 179)

2. A shift in the objects of science from visible and measurable magnitudes, such as numbers, forces, and prices, to impalpable, invisible magnitudes that obliges scientists to look for an indirect measurement of phenomena and search for traces, signs, and marks, such as fingerprints, the color of the skin, or the shape of the skeleton. This shift implies an extensive use of statistics and probability as major analytical instruments. The contrast is clear: on the one hand, an epistemology of visible quantities; on the other, an epistemology of hidden qualities.[32]

This quest for hidden objects or traits belongs to a double genealogical heritage of hygiene and the laws of heredity, with a "synthesis" of both traditions in the writings of Galton and Pearson. The former can be traced back to Pasteur and inspired many 19th-century social reform movements in Europe. Directly linked to the then-recent rediscovery of Mendelian genetics, the latter was developed by Hugo De Vries, Biffen, and Davenport—a rather contemporary genealogy—but, again, strikingly marked by a growing new articulation between two different levels: the level of science and the level of social reform. Within less than half a century, the field moved from Mendel to Davenport, from Pasteur to Galton, from analysis to probabilities, from biology to criminality, from medical hygiene to social hygiene, from laboratory experiments to social interventions.

Fisher was well aware of this move. Moreover, for him, the swing from deductions to probabilities or from blood and genes to economics and civic behavior was precisely what gave modern eugenic theories their scientific value and their social interest.

3. Eugenics therefore is a meta-theory for all social sciences. This is the third shift Fisher advocated for: from a micro perspective to a macro perspective. In the same presidential address as he espoused his "viewpoint as a student of economics" to the members of the Eugenics Research Association, Fisher came out in favor of a "telescopical" view of eugenics:

> Hitherto, eugenics has been largely studied "microscopically", that is by special technical laboratory investigations. The next step is to study it more "telescopically", that is by observation of the general facts of human history. I do not mean, of course, that eugenists should drop their study of the inheritance of fingerprints or of the inheritance of musical capacity, eye defects, skeleton abnormalities and twinning . . . But in addition to all these, steps should be taken to organize the study of the eugenics or dysgenics of such historical events as war, immigration, colonization, prohibition, hygiene, birth control, feminism, capitalism, industrialism, democracy, socialism, bolshevism, population growth, urbanization, and diminishing returns in agriculture. ([1929] 1997: 179)

His ambition was becoming borderless—and the rationale given for it is that eugenics should be the ultimate reference for all social sciences. Hence, when economics and eugenics lead to divergent

appreciation on a given subject, the line of "science" should be found within the eugenics view. A good example is the effect of inventions on economic growth. "Inventions are generally regarded as landmarks of progress," said Fisher at a meeting of the Eugenics Research Association. "They have, thus far, undoubtedly caused progress in *economic* well being and permitted an ever-increasing *number of people* to subsist in a given area. . . . But the eugenist is interested in the quality of human beings rather than their quantity, and one of the great problems to be seriously considered, is whether our boasted 'progress' is not an illusion and whether after all the human race, in spite of its rapid multiplication and its increase in per capita wealth, may not be deteriorating" ([1929] 1997: 180; emphasis in original). Diverging analyses thus lead to diverging conclusions: "The economist has shown that wealth accumulates. The eugenist may show that men decay" ([1929] 1997: 180). And Fisher clearly stood on the side of eugenics, using the 200-year-old argument of the "luxury quarrel"[33] to confirm that the "science of eugenics" should dominate the science of economics.

Fisher's eugenic "crusades" were numerous. Among them, three topics give archetypal examples of such close articulation between economic theory and eugenic assumptions or considerations: the theme of a "racial decay" of the American population, his analysis of the eugenic effects of World War I, and his position on the then-haunting question of the "Golden Door."

III

"The Menace of Race Deterioration"

1915, Battle Creek, Michigan. At the Second National Conference on Race Betterment, Fisher delivered a speech centered on the question of "race decay." "The more I have tried to study the actual facts as to the present physical condition of the human race, the more I am convinced of the tremendous power of the degenerative tendencies," he declared ([1915b] 1997: 175). The theme of the necessity of struggling against "the menace of race deterioration" was of central importance to the late-19th-century eugenic movements, both European and American.[34] Fisher's predications against what he also named "race

suicide"[35] were many. And the solution he offered was always the same, clearly sketched in his *Elementary Principles of Economics*: "A method of attaining the contrary results—namely, reproducing from the best and suppressing reproduction from the worst—has been suggested by the late Sir Francis Galton of England, under the name of 'eugenics'" (1911a: 476).

The subsequent question was how to determine "the best" and "the worst." Fisher's two answers were strongly consonant with the two major methodological trends of the times: statistics and probabilities. One method consisted of collecting "statistics of the feeble-minded, insane, criminals, epileptics, inebriates, diseased, blind, deaf, deformed and dependent classes" ([1921] 1997: 180), a task that he largely contributed to throughout his active engagement in the Eugenics Record Office, as well as in various government committees. The method had a direct heuristic value: "What is needed now in political economy," advocated Fisher as chairman of the economic section of the American Association for the Advancement of Science, "is to rid ourselves of the false and superficial theories, on the one hand, which have been constructed *a priori* and irrespective of facts; and, on the other hand, to release ourselves from the cheap empiriscism of the historical school, who interpret their task as merely one of generalizing phenomena without analyzing them. Science is one. The logic for economic science should be the logic for all science—a combination of induction and deduction."[36] Thus the role of Galtonian and Pearsonian mathematical statistics in the construction of this new science.[37]

A second method consisted of applying the laws of probability to heredity, or, in Fisher's words, to human "pedigrees." "Few people have any idea, unless they have looked into the *pedigrees* of some of these people, what awful contamination can be saved the race by a wise application of eugenics" ([1913] 1997: 170; emphasis added). Canonically repeated in many articles or addresses, the demonstration was built upon the archetypal opposition of four families:[38] two "honorable" families—Jonathan Edward's family and the Darwin family, described at length by Galton in *Hereditary Genius*—and two criminal families—the "Jukes," whose largely invented story by Richard L. Dugdale "became the most influential American work on heredity during the nineteenth century"[39] and the "Tribe of Ishmael,"

named and described on the model of Dugdale's book by Oscar C. MacCulloch.[40] The whole tale is not exempt of manicheism or of some insidious anti-Semitism. Among the first two families were some hereditary dignitaries: Charles and Leonard Darwin and Francis Galton. However, there were also the 1,394 descendants of Jonathan Edward, out of which, according to Fisher:

> something like half have been public men or men of great distinction and good influence in the world; 295 were college graduates, about 100 were clergymen or missionaries, over 100 were lawyers, 80 held public office, 75 were officers in the army or navy, 60 were eminent writers, 30 were judges, 13 were college presidents. ([1913] 1997: 171)

Symmetrically, the other two families produced nothing but paupers, thieves, misfits, prostitutes, and convicted criminals. Descendants of an ancestor born in 1720 and described by Fisher as a "thriftless fisherman," the "Jukes" are supposed to count about 1,200 members, among which, he wrote, "310 were professional paupers who spent in all two thousand three hundred years in poorhouses, 50 were prostitutes, 7 murderers, 60 habitual thieves, and 130 common criminals" ([1913] 1997: 27, 171). Quoting Dugdale, Fisher added that it could be estimated that "the 'Juke' family had cost the Government over $1,000 for each member of the family" ([1913] 1997).[41] The same held for the so-called Tribe of Ishmael: over 1,692 individuals, and in six generations described as having "produced 121 known prostitutes and . . . bred hundreds of petty thieves, vagrants and murderers" ([1913] 1997: 171).

Prostitution, robbery, vagrancy, poverty, criminality, alcoholism: quite clearly, the vices tracked down by Fisher as hereditary were not biological features but social deviations.

Hence, "race suicide" was also a central subject for Fisher's economic analysis. Following the demonstration launched half a century before in France by Bénédict-Augustin Morel and Jacques Moreau de Tours,[42] Fisher asserted that if the wealthier part of the population did not succeed in demographically reproducing itself, the resulting "decay" would provoke a decline in the welfare of the whole nation.[43] Morover, his numerous analyses of the rate of interest often called for an explanation of the rate of interest of a nation by the value of its "human capital"[44] and an explanation of the value of this "stock of

human capital" by the value of the "germ plasm" of the race. The thought process was often repeated: "One cause of poverty of the individual and the nation is lack of forethought. One of the first symptom of racial geneneracy is decay of foresight" ([1909] 1976: 748).

One can therefore read in the *Elementary Principles of Economics* that the "negroes from Philippins" had so little ambition and such a low marginal rate of valuing money that only their need for alcohol gave them an incentive to join their workforce.[45] Or that "among communities and peoples noted for lack of foresight are China, India, Java, the negro communities in the Southern states, the peasant communities of Russia, and the North and South American Indians, both before and after they have been pushed to the wall by the white men" (1912: 404). Or, in *The Theory of Interest*, that "[i]n the case of primitive races, children, and other uninstructed groups in society, the future is seldom considered in its true proportions" ([1930] 1997: 81). Or that "the Scotch, the French peasants, and the Jews [have a] propensity to accumulate and to lend money even in the face of misfortune and social ostracism [that] is well known" ([1930] 1997: 81). Or that "[t]he negroes of Africa are perhaps even less provident than the American Indians" ([1930] 1997: 416). All these elements were again joined together in another general typology of "communities and peoples" from "India, Java, the negro communities both North and South, the peasant communities of Russia, and the North and South American Indians, both before and after they had been subjugated by the white man," all "noted for lack of foresight and for negligence with respect to the future" ([1930] 1997: 415)—and therefore all responsible for the high rate of interest and the subsequent declining wealth of their respective nations.[46]

The argument always used the same rhetoric: when struggling against the "racial decay of the stock of human capital of the nation," when reinforcing "the innate vitality of the human race,"[47] eugenic measures could be considered as the most powerful and most efficient tools, not just of hygiene or social policy, but chiefly of economic policy.

Such measures embraced three major sets of propositions. The simplest ones, like the anti-alcohol crusade or the campaigns in favor of national health, joined hygiene and eugenics:[48]

> The most vital problem before the world today is the problem of preventing racial deterioration. The stamina of the human race is menaced in at least two special ways: one sudden change in conditions of living to which the human race has been subjected during the last few generations . . . Race poisons, like alcohol and tobacco, to say nothing of the more pernicious habit-forming drugs . . . are special features in man's new and artificial environment. ([1915a] 1997: 177)

Hence Fisher's campaigns in favor of Prohibition and, more generally, in favor of any reinforcement of repressive judicial measures against drugs, alcohol, or tobacco. Hence also his many denunciations of the economic cost of the "dysgenic" institutions that appeared in the United States with the welfare state, in Fisher's terms, institutions of "*misapplied* hygiene—hygiene to help the less fit."[49] "Schools for tubercular children give them better air and care than normal schoolchildren receive," he claimed. "Institutional care of defectives often surpasses that in the home" ([1915a] 1997). There were so many reasons to condemn "the folly of such differential care of the biologically unfit" ([1915a] 1997).

Again he made use of economic arguments in these campaigns,[50] and once more there was a strong methodological swing between the two fields. If eugenics is to provide economics with some explanations of the value of the stock of human capital, economics may offer some new instruments to eugenics in its attempt to appear as a "science," such as when Fisher advocated in favor of the economic benefits of vitalism, or when he described as "investments" the public campaigns against hookworm, "the germ of laziness,"[51] or tuberculosis.[52] "The prevention of disease . . . increases economic productivity," he wrote in the very first paragraph of his report on *National Vitality* ([1909] 1976: 623). In a like manner, when pleading in favor of vitalism in front of the Committee of One Hundred for National Health, he calculated the effects of Prohibition on economic productivity. The link between alcohol and productivity was supposed to be given by theory, and the percentages by experimentation:

> Since scientific research has shown that alcoholic beverages slow down the human machine, and since the human machine is the most important machine in industry, we should expect the use of alcoholic beverages to slow down industry, and we should expect prohibition, if enforced to speed up industry. Experiments show that two or four glasses of beer a day will impair the work done in typesetting by 8 per cent, increase the

> time required for heavy mountain marches 22 per cent, and impair accuracy of shooting under severe Army tests 30 per cent. . . . Assuming the total alcohol used in the United States to be consumed uniformly among its families and assuming . . . that each daily glass of beer reduced productivity 2 to 4 per cent, it follows that the productivity of labor would be increased from 10 to 20 per cent, by effective prohibition. ([1926a] 1997: 126)

Hence a strange conclusion from the point of view of economic theory: there was a direct causal link between Prohibition and the 36 percent increase in real wages between July 1914 and January 1925![53]

A second set of propositions meant to improve the value of the stock of human capital dealt with segregation between the sexes, or measures to forbid reproduction of the "defectives, feeble-minded, idiots, epileptics, insane, etc." ([1913] 1997: 170). An edifying example from the beginning of the 20th century often quoted by Fisher concerned the severe rules of segregation through which the Aosta government in Italy forbade any form of marriage between "cretins." He described this measure as "quiet," "simple," and "without violence to existing ideas to what is right and proper" ([1913] 1997: 170) and drew the conclusion that this sole decision was responsible for the drastic statistical reduction of cretinism among the population within 10 years.

Once more "harnessing" theory and practice, Fisher became deeply involved in promoting laws designed to limit marriages among some categories of the population, which were adopted by numerous states between 1896 and 1930.[54] He also advocated in favor of a "segregation of the sexes" for the ever-repeated list of "defectives, feeble-minded, idiots, epileptics, insane, etc." in his widely read *How to Live*, in which both the problem and the solution are described in epidemiologic terms: "By this kind of isolation we can save the blood stream of our race from a tremendous amount of needless contamination."[55]

The same desire for a purified race was at stake in a third set of measures of "negative eugenics," whose object was to fight against moral and social "vice." These quite radical measures concerned the sterilization of "dysgenic" individuals, another project described as an efficient way to save "the germ plasm of the human race" ([1913] 1997: 170).

The battle was, once again, a legislative one. The American eugenics movement lobbied fiercely in favor of measures of forced sterilization for entire categories of the population. These measures were finally adopted in a large number of states: first in Indiana, California, and Connecticut, and soon thereafter in 24 other states.[56]

Fisher was mostly active in this fight, advocating in favor of the institution of "Eugenics boards" in every state of the country ([1913] 1997), of birth-control measures imposed upon "coloured races," and of forced sterilization of the "dysgenic" elements of the population. His motto on this theme was clear and brutal: *"breed out the unfit and breed in the fit*" ([1921] 1997: 187).

In a 1930 speech given at the American Eugenics Society, he expressed his satisfaction about measures of forced sterilization, which had been progressively enacted by many states. "[S]omething real has been accomplished . . . There has . . . been legislation for sterilizing people who are public charges and who ought not to reproduce their kind; in general, the sterilization has been voluntary. Some six thousands such surgical operations have been performed in California, and probably well over ten thousands in the country as a whole" ([1930b] 1997: 203).

The litany was rather repetitive: the objective was to purify humanity from its marginals and its deviants by fighting all forms of laissez faire as far as the "quality" of human capital was concerned. This in the name of "science" and "reason." "The time has come," he concluded a 1915 address to the members of the American Public Health Association, "when science must subdue custom and reason triumph over tradition" ([1915b] 1997: 79). Hence Fisher's dream—and utopia:

> Yet, in the light of modern eugenics we could make a new human in a hundred years if only people in position of power and influence would wake up to the paramount importance of what eugenics means. ([1913] 1997: 170)

IV

The Great War: A "Eugenic Tragedy"

EUGENICS MEASURES COULD BE measures of "negative eugenics" or measures of "positive eugenics." Fisher's repeated theoretical link between

the "value of the human capital" of a nation and its wealth lead not only to "breed out the unfit and breed in the fit," but also to protect the existing elite.

The preliminary statements of the "Membership Pledge of the Life Extension Institute" were very clear: "the Great War has emphasized anew the urgent need of a strong, virile race to guarantee the perpetuity of the American Nation and its institutions."[57] To Fisher, the "real tragedy of the European conflict is a eugenic tragedy," as he proclaimed in his 1915 contribution to the San Francisco National Conference on Race Betterment ([1915b] 1997: 176). This position was made more precise in an article, written the same year, on "The Menace of Racial Deterioration":

> The most vital problem before the world to-day is the problem of preventing racial deterioration. The stamina of the human race is menaced in at least two special ways: one the sudden change in conditions of living to which the human race has been submitted during the last few generations. . . . The second great cause tending to produce a racial degeneration is war. Of all the tragedies of the present war the greatest is one we seldom see mentioned, the destruction of the flower of the manhood of Europe. . . . We could even afford to witness with some equanimity the destruction of millions of lives if these lives were of inferior quality; but the destruction of the best means an irreparable blow to man as man . . . The movements for permanent peace and the movements for eugenics and race betterment are the ones directed most definitely against race deterioration. ([1915a] 1997: 177)[58]

Fisher once again called for eugenic research and eugenic measures, this time as a means to "neutralize the dysgenic effect of the great war" ([1921] 1997: 180). His plea was clear:

> If nothing of the sort happens . . . then surely the dark ages lie ahead of us. The Nordic race will, as Madison Grant says, vanish or lose its dominance if, in fact, the whole human race does not sink so low as to become the prey, as H. G. Wells imagines, of some less degenerate animal! ([1921] 1997: 183)

The argument was often expressed in economic terms. "Very few realize how costly the war is, not in money, not in munitions, not even in men as we count them, but in the manhood of men,—men reckoned in quality, not in quantity" ([1917a] 1997: 82). He repeated the cost argument over the years. "What did the war cost?" asked

Fisher in 1923 ([1923a] 1997: 227). A "money cost"? A "cost in human lives"? A "cost in morale"? A "cost in the vigor of the next generation"? Or a "cost in racial vigor"—"the greatest war cost"? French wars of the 19th century provided a historical comparison:

> The Napoleonic Wars shortened the stature of the French race by killing off so many tall soldiers whose height should have been inherited had they lived to have children. So also the World War has killed off the healthiest, strongest, bravest and most intelligent young men of Europe—medically selected for slaughter. ([1923a] 1997: 227–228)

The argument was repeatedly the same, based on a supposed correlation between the quality of the stock of human capital and the wealth of a country, between the "racial vigor" of a nation and its comparative economic power. It would be repeated again through the question of immigration.

V

Restriction: A "Golden Opportunity" for the Eugenic Movement

When Fisher began to write on immigration, the question had already been a subject of many intense disputes for American economists. In 1891, Francis Amasa Walker, acting as president of the young American Economic Association, urged its members to work on the "gloomy" prospect of the new trends of immigration:

> We are now draining off great stagnant pools of population which no current of intellectual or moral activity has stirred for ages. Thousands and hundreds of thousands of those who represent the very lowest stage of degradation to which human beings can be reduced . . . are found among the new citizens whom the last decade has brought into the republic; and these are but the forerunners of hundreds of thousands and millions more, unless this stream is checked. . . . The subject deserves, demands, instant and full consideration. The Economic Association can do no better service to the country than by taking it up for earnest, candid, searching investigation. (Walker 1891a: 37)

Diverse opinions soon flourished. The basic racism of the first restrictionist movements, which was still very present in John R. Commons's *Race and Immigrants* (1908), had partly been replaced by a more sophisticated Darwinism, well illustrated by Richmond Mayo-Smith's

book *Emigration and Immigration* (1890).[59] Times were ready for "Nativism," championed by Francis Amasa Walker, who relied on the compared statistics of the 1870 and 1890 Census to nourish the great end-of-the-century demographic fear: 5 million new immigrants between 1880 and 1890, a clear decline of fecundity among native-born Americans, and, at the end of the period, immigrants from southern and eastern Europe overwhelming those from northern Europe (see Walker 1891b).

Economists had also been actively campaigning in favor of restriction. In 1894, Prescott F. Hall, recently graduated in economics and law from Harvard, founded the Immigration Restriction League and involved it in intense lobbying. Results came quickly. A bill that would impose alphabetism tests on every immigration candidate was approved in 1896 by a large majority in Congress but vetoed by President Cleveland. In 1907, Congress instituted a committee of nine members in charge of evaluating the effects of immigration on society. Among them was Jeremiah W. Jenks, a well-known restrictionist economist. In 1913 and 1915, a new bill was introduced and approved by Congress, but it was vetoed successively by presidents Taft and Wilson. In January 1917, in spite of a second veto by Wilson, Congress adopted the Literacy Act. It obliged adults who wanted to immigrate to prove their ability to read and write between 30 and 80 words, either in English or in their mother tongue, and to undergo intelligence tests. "Immigration," proclaimed the American Eugenics Society in 1928, "should be first of all considered a long-time investment in family stocks."[60]

Fisher seized what he sees as a "golden opportunity" for the young American eugenics movement. As he wrote in 1912 to Davenport:

> Eugenics can never amount to anything practically until it has begun, as Galton wanted it, to be a popular movement with a certain amount of religious flavor in it, and as religion is akin to patriotism and there is already a sentiment in favor of restricting immigration, and as the Immigration Commission is to report, I am credibly informed, strongly recommending further restrictions on immigration, it seems to me that this is a golden opportunity to get people in general to talk eugenics.[61]

Fisher thought that immigration should be considered as both an topic for economic theory and as a fight for eugenics. "Economically,

immigration of cheap labor is beneficial (initially at least) to capital and injurious (initially at least) to native labor," he wrote. The conflict between these two interests, of capital and of labor, constituted most of what is ordinarily included in the " Darwinian" analysis: "If we allow ourselves to be a dumping ground for relieving Europe of its burden of defectives, delinquents and dependents, while such action might be said to be humane for the present generation, it, would be quite contrary to the interests of the humanity for the future" ([1921] 1997: 191).

Once again, the two logics seem to diverge before joining under the banner of eugenics:

> The core of the problem of immigration is, however, one of race and eugenics. If we could leave out of account the question of race and eugenics I should, as an economist, be inclined to the view that unrestricted immigration, although injurious to some classes, is economically advantageous to a country as a whole, and still more to the world as a whole. But such a view would ignore the supremely important factors. . . . Our problem is to make the most of this inheritance [of the 8,000 immigrants who arrived before 1741]. We can not do so if that racial stock is overwhelmed by the inferior stock which "assisted" immigration has recently brought. ([1921] 1997: 191)

The economic example and the eugenic example therefore met on the grounds of their heuristic content, again illustrating the reordering between the respective ranks of the two disciplines. Two years later, in Fisher's *Report of the Committee on Selective Immigration of the Eugenics Committee of the United States of America*, there was but one argument left: "The original in favor of the percentage law was economic. The fundamental reason for its continuance is biological" ([1923] 1997: 198).

Uchronia was a quite familiar rhetorical mode in the eugenic propaganda of the time, and it served Fisher in his conclusion:

> Experts have told us that had mental test been in operation, and had the "inferior" and "very inferior" immigrants been refused admission to the United States, over 6,000,000 aliens now living in this country, free to vote, and to become the fathers and mothers of future Americans, would never have been admitted. The facts are known. It is high time for the American people to put a stop to such degradation of American citizenship, and such a wrecking of the future American race. ([1923] 1997: 198)

VI

Conclusion: Fisher's Anamorphosis

YET THE INITIAL QUESTION of this article has not been entirely solved: How could such different disciplinary references as classical mechanics and Galtonian unbridled eugenics fit in the same theoretical framework? One clue might be given their different rhetorical techniques; some references work as metaphors, others as analogies, homologies, or identities.[62]

The mechanical reference clearly functions in *Mathematical Investigations in the Theory of Value and Prices* as a homology, that is, as a formal similarity between the objects, vectors, equations, theorems, and results of physics and the objects, vectors, equations, theorems, and results of mathematical economics. Medicine provides a second reference. Fisher often referred to medicine when opposing the level of theoretical research to the level of social therapy, using it as a metaphor: science should help in "healing" the social body, "eradicating the germs" of both physiological and behavioral diseases, "curing" society from alcoholism, "enhancing the vitality" of American citizens. Positive science as a reverse to normative action is how Fisher exhorted his fellow economists to come out of their "academic seclusion," to stop being "concerned principally with pure theory and leaving the vulgar world to take care of itself" in order to "seek practical applications for their principles" ([1919a] 1997: 6).

A third reference, more precisely targeted in this article, comes from genetics and the pseudo "laws" of heredity. Fisher did not use this univocally. Some writings relied on a strong identical relation postulated through a continuous reference to the idea of the decay of the human capital stock of the nation and the consequent necessity, from both an economic and a eugenic point of view, of regenerating it: the economic cost of war was identified with its genetic cost; the aims of immigration policies were identified with some investments in human capital quality; a campaign to improve national health was described as economically productive because it was genetically beneficent. Other writings were rooted in homologies, such as when Fisher offered an explanation of the determinants of the interest rate

in terms of racial, hereditary, or genetical overdetermination of individuals. Fisher's seminal concept of "human capital," on the other hand, first relied upon an inaugural analogy within the field of pure theory between the economic concept of capital, described as a "stock," and the biological notion of "genetic stock," before being used in some much more "realistic" (in Fisher's terms) acceptations.

Such an intertwining of references and metaphors forbids any univocal reading of Fisher's "crusading" texts. It is unquestionable that there is a strong biological and hereditary filigree in his economic writings subsequent to 1906. It was out of doubt that eugenics appeared, under Fisher's pen, as a general matrix for all social sciences. But that Fisher's only scientific model was dictated by the methodological criteria of the early-20th-century eugenics creed cannot be soundly argued. Neither his first writings on general economic equilibrium nor his works on monetary theory or on index numbers can be deciphered through a biological or a eugenical framework.

There remains the unquestionable intellectual influence of a eugenic *doxa* on Fisher's social and economic thought, the constant reference to the themes of the decay of the quality of the stock of human capital of the nation. There remains what Fisher considered as a "scientific" explanation of the rate of interest by racial, hereditary, or genetic overdeterminations of social behaviors. There remains the heuristic use of the concept of human capital, both in its theoretical foundations and in its realistic uses. There remains a permanent quest for statistics on some hidden qualities of the economic agents, which did modify Fisher's views on the general methodology of economic theory.

* * *

An anamorphosis is the pictorial technique that allowed early Renaissance painters to hide a forbidden image, such as a symbol, a portrait, a naked body, under an apparently banal painting. When looking at the picture from a different perspective—a raking angle or a curved mirror—the spectator is allowed to discover the other image. Eugenics provided Fisher's anamorphosis: not just a way of tooling

economics with new concepts, new examples, or new methods, but rather a way of giving both economic theory and economic policy their *Weltanschauung*. This was probably the major lesson of this "crusading" corpus: "I believe," wrote Fisher in 1913, "eugenics will be in the future the essential foundation of ethics. . . . There is not yet an accepted scientific foundation for right and wrong. I verily believe that eugenics is going to supply such a foundation. . . . The time will come when, instead of asking whether eugenics is right or wrong according to some false conventional standard, we shall ask ourselves whether these conventional standards are right or wrong according to the standard of eugenics, the highest standard there is" ([1913] 1997: 173). One century later, this strange and dangerous utopia might not have been entirely abandoned by the economics profession.

Notes

1. This is the title of the third chapter of the second part of Fisher's doctoral dissertation, *Mathematical Investigations in the Theory of Value and Price* (1892), reprinted in *Works* I: 39–170 (here, 129–130).

2. Fisher had arrived in Yale in 1884. After his graduation, he entered the graduate school, studying mathematics under Josiah Willard Gibbs and political economy with William Graham Sumner. In 1898, Yale appointed him professor of political economy, a position he was to keep until the end of his professional life.

3. Quite immodestly, Fisher also underlines the success of this entreprise: "It was, I believe, largely through my work and influence that the use of mathematics was introduced and developed in economics" ([1946] 1997, vol. I: 23).

4. This essentially in the years that followed the *Mathematical Investigations in the Theory of Value and Prices*. See, as an example, the article he published in the *Economic Journal* on "The Mechanics of Bimetallism" ([1894] 1997, vol. I: 177–187).

5. See the hydraulic mechanism described in the *Mathematical Investigations in the Theory of Value and Prices*, twice built by Fisher. The first time the funding came from Henry W. Farnam, who presented it to Yale University with the aim of having it exhibited at the Chicago's World Fair as part of Yale's exhibit. The second machine was rebuilt by Fisher himself, who regularly used it in his classroom, when the rubber parts of the first one wore

out. Fisher's account of this story is reproduced in *Fisher's Unpublished Annotations to Mathematical Investigations in the Theory of Value and Prices* (1997, vol. I: 171). An acurate presentation of Fisher as a model builder is provided by Mary S. Morgan (1999).

6. Fisher to Will Eliot, June 29, 1895, quoted in 1997, vol. I: 10, footnote c.

7. The story was told by Fisher in 1941. "One day, I confided to him [Sumner] my growing perplexity as to how I was to write my doctor's dissertation, since only half my time had been spent on mathematics, the other half having been mostly in economics. He immediately said: 'Why not write on mathematical economics?' I replied 'I never heard of it.' He then told me about Jevons and Walras, who between 1871 and 1874 independently introduced the concept of marginal utility as a differential quotient." (1997, vol. I: 185).

8. See Fisher's numerous inventions of day-to-day new techniques or new objects: a portable stool, a folding icosahedral world map, or his famous index visible filing system.

9. An engagement that stayed largely underestimated by most historians of economics—with the very notable exception of Mark Aldrich, whose 1975 article played a major role in bringing this material to light, thus largely pioneering some of the articles (including mine, which owes him much of its first references) in this issue of the *American Journal of Economics and Sociology*.

10. Irving Fisher to Margaret Hazard Fisher, San Francisco, California, July 12, 1924. 1997, vol. XIII: 1 (emphasis added).

11. This, as well as the 13 other volumes, is thanks to William J. Barber, assisted by Robert W. Dimand and Kevin Foster, and advised by James Tobin. Most of the original material is kept in the Fisher Papers at the Department of Manuscripts and Archives of Sterling Memorial Library at Yale University.

12. See Cot (1989, 2004).

13. As well as Ellsworth Huntington at Yale, Rosswell H. Johnson at Harvard, Frederick Adams Woods at MIT, Raymond Pearl at Johns Hopkins, and Edward A. Ross at the University of Wisconsin, Albert E. Wiggam, Frederick Adams Woods, William E. Kellicott, Michael F. Guyer, Roswell H. Johnson, and Paul Popenoe all published textbooks on eugenics. The number of American colleges offering courses in eugenics rose between 1914 and 1928 from 44 to 376 (see Paul 1995: 10–11). In the world of business and politics, Theodore Roosevelt, John H. Kellogg, Coleman DuPont, R. Bayard Cutting, Bleecker van Wagenen, Henry Clay Frick, and Mrs. E. H. Harriman all were well-known active members of the American eugenics movement. See Hofstadter (1945: 138–145); Haller (1984: 74); Cherry (1976: 150–153); Aldrich (1975); Hodgson (1991, 1992); and Leonard's article in this issue of the *American Journal of Economics and Sociology*.

14. When the Committee was disbanded in 1923, the Executive Committee voted that its remaining money should be donated to the Eugenics Committee of the United States of America. See Fisher's letter to the members of the committee (1923c).

15. *National Vitality, Its Waste and Conservation: Report of the National Conservation Commission* (1909). See the Summary of the report in *Works*, vol. XIII: 21–40 and, more precisely, the advocacies in favor of eugenic measures, 26–28 and 35–36.

16. Davenport had earlier contributed to creating the first eugenics institution in the United States, a special committee of the American Breeder's Association, designed in 1906 "to investigate and report on heredity in the human race." See Degler (1991: 43).

17. Together with Charles B. Davenport, David Starr Jordan, Lewellys F. Barker, Walter E. Fernald, Elmer E. Southard, and Robert M. Yerkees; see Haller (1984: 71).

18. This, also in Cold Spring Harbor, near the Station for the Study of Experimental Evolution. The 80 acres of land were bought with the financial help of Mrs. Edward Henry Harriman, one of the important characters of the American eugenics movement, who contributed significantly for the next seven years to the Eugenics Record Office budget. Davenport became resident director of the Eugenics Record Office, with Harry H. Laughlin as superintendant. In 1921, the Carnegie Institution consolidated the Eugenics Record Office and the Station for Experimental Evolution into a Department of Genetics, also directed by Davenport: see Haller (1984: 64–66).

19. See *Works*, XIII: 160, footnote b. The Eugenics Record Office published one of the important newspapers in the field, the *Eugenical News*.

20. Fisher to Charles B. Davenport, October 17, 1911. Davenport Papers, American Philosophical Society Library. Quoted in *Works*, XIII: 161.

21. Where he was elected in 1917, succeeding to Alexander Graham Bell; see Fisher, *Works*, I: 35.

22. Irving Fisher to Charles B. Davenport, June 22, 1913. Quoted in Haller 1984: 74.

23. Fisher had met John H. Kellogg in 1904 as director of a sanitarium at Battle Creek. It was Kellogg who introduced him to the "systematic experimentations" Fisher would pursue with his Yale students, serving as "laboratory animals" (see *Works*, XIII: 74). The Foundation was to hold "highly publicized" "Race Betterment Conferences" in 1913, 1914, and 1928: see Haller (1984: 71).

24. I quote this expression from Reilly (1991: 77). Among the other founders of the American Eugenics Society were Henry Crampton, Henry H. Laughlin, Henry Fairfield Osborn, and Madison Grant, author of *The Passing of the Great Race* (1916), president of the New York Zoological Society, and friend of Theodore Roosevelt.

25. More specifically, since his very active chairing of the Ad Interim Committee, which came out of the Second International Eugenics Congress in 1915, which then became the Eugenics Committee of the United States of America in 1922, which in turn organized the Eugenics Society of the United States of America, which changed its name to the American Eugenics Society in 1925: see Haller (1984: 74); and Fisher, *Works*, I: 35.

26. One year earlier, in his *Elementary Principles of Economics*, the definition was more detailed: "A method for . . . reproducing from the best and suppressing reproduction from the worst—has been suggested by the late Sir Francis Galton of England, under the name of 'eugenics'. This movement, which promises to become a strong one, aims to prevent (by isolation in public institutions and in some cases by surgical operations) the possibility of the propagation of feeble-minded and certain other classes of defectives and degenerates, and also to develop a public sentiment which shall condemn marriages in which either husband or wife has a transmissible disease, or any inheritable taint of epilepsy, insanity, etc., or is otherwise unfit to become a parent" (Fisher 1912: 476). For a more complete presentation of this program, see Galton (1904, 1909).

27. Galton had used the word *viriculture*, and the first American eugenic movements were fond of the expression *stirpiculture*; see Ward (1913: 737–738).

28. One of the first eugenic organization in the United States was the American Breeders' Association, formed in 1903 by agricultural breeders and academic biologists. In 1906, the Association set up a Committee on Eugenics "to investigate and report on heredity in the human race," as well as "to emphasize the value of superior blood and the menace to society of inferior blood" (Haller 1984: 62). In 1910, the Committee became a "Eugenics Section" of the American Breeders' Association, chaired by David Starr Jordan, with Charles B. Davenport acting as secretary (see Field 1911: 35–36). The Association would later set afoot an influential Committee on Sterilization, chaired by Bleeker Van Wagenen and, in 1912, a Committee to Study and to Report on the Best Practical Means of Cutting Off the Defective Germ Plasm in the American Population: see Reilly (1991: 43, 58–61).

29. See Hawkins (1997: 217), from whom I borrow these four assumptions of all basic Galtonian constructions.

30. See, for instance, Fisher ([1909] 1976: 719).

31. Fisher to Charles B. Davenport, December 18, 1913. Davenport Papers, American Philosophical Society Library. Quoted in *Works*, XIII: 4.

32. An example, repeated many times by Fisher, illustrates this obsessive search for hidden features: "Misapplied hygiene is likely to be injurious to the race. I was astonished at the ignorance of a university president with whom I conversed some years ago. He was very enthusiastic over hygiene and what it can do. He said 'I know of a girl who had many ailments and

disabilities. She had a surgical operation to remedy one difficulty and special treatments to remedy others, so that finally she was so repaired and improved that as to be made over into quite a respectable human being, and *now she is married*. Just think what a wonderful thing that is.' Well the truth was such a result is greatly to be deplored. The hygiene was misapplied. This girl was really defective, and the pity of it is that her children and grandchildren are likeley to have a certain percentage of defects" ([1913] 1997, *Works*, XIII: 171; emphasis in original).

33. "We know that affluence often ruins men and women, and history has at least produced a strong suspicion that it was the cause, or *a* cause, of ruin of many civilizations now dead." ([1913] 1997, *Works*, XIII: 180; emphasis in original). The argument was widely used in Europe by the Roman Catholic Church during the 17th and 18th centuries.

34. See "The Menace of Race Deterioration," published by Fisher in 1915 in the *Journal of the National Institute of Social Sciences*.

35. Fisher ([1921] 1997, vol. XIII: 190). The expression "race suicide" seems to have been first used in the United States by Edward A. Ross in his 1901 article "The Causes of Race Superiority" and then popularized by Ross's disciple Theodore Roosevelt: see Ward (1913: 751) or Paul (1998b: 101–102).

36. This statement is quoted by Fisher himself (1933: 8).

37. Directly borrowed from Galton, these new statistics point at exceptions rather than averages. As Ted Porter convincingly points out: "The statistical techniques of astronomers, which Quetelet had sought to imitate, seemed to Galton wholly unsuitable, since they were designed to eliminate errors and deviations, the very objects that he most wished to study and preserve" (1986: 129). It is therefore logical that biometrics (as well as evolutionary eugenics) would remain "the discipline most closely associated with statistical innovations until at least the 1930s" (1986: 314).

38. One of the first detailed uses of this story is made by Fisher in his *Report of the National Conservation Commission: National Vitality, Its Waste and Conservation* ([1909] 1976: 675–676).

39. Haller (1984: 21). See also Reilly's comment on Dugdale's Lamarckism (1991: 10).

40. Oscar C. MacCulloch, *The Tribe of Ishmael. A Study in Social Degeneration. Report of the Fifteenth Annual Conference on Charities and Correction* (1888: 154–159). Quoted in Fisher ([1909] 1976: 675–676).

41. *Ibid.*: 27, or 171. The 1926 pamphlet of the American Eugenics Society, *A Eugenic Catechism*, repeats the argument in its section on segregation and sterilization:

> Question: How much does segregation cost?
> Answer: It has been estimated that to have segregated the original "Jukes" for life would have cost the State of New York about $25,000.
> Question: Is that a real saving?

Answer: Yes. It has been estimated that the State of New York, up to 1916 spent over $2,000,000 on the descendants of these people.
Question: How much would it have cost to sterilize the original Jukes pair?
Answer: Less than $150. (quoted in Paul 1995: 82)

42. See Morel's *Traité des dégénérescences physiques, intellectuelles et morales* (1857) and Moreau de Tours's *La psychologie morbide dans ses rapports avec la philosophie de l'histoire* (1859).

43. See Fisher's numerous references to Morel in his economic courses at Yale, first quoted by Mark Aldrich (1975: 35ff).

44. The concept is quite often used by Fisher: see, for instance, 1897: 212; 1906a; or 1911.

45. Although both Mark Aldrich and Bob Dimand notice that some of these references found by Fisher in John Rae's book were taken out in the second edition of the book in 1930. See Aldrich (1975: 42, n. 55); and Dimand's article in this issue of the *American Journal of Economics and Sociology*.

46. The analysis is sometimes softer, but the conclusion stays the same: "In many if not all cases which have been cited there are, of course, other elements which would tend to explain the facts besides mere mental characteristics. Thus, the high rate of interest among the negroes and the Russian peasants is undoubtedly due in part to their poverty, though their poverty is in turn due in varying degree to their mental characteristics" ([1930] 1997, vol. IX: 415).

47. Fisher (1917b, quoted in Aldrich 1975: 37).

48. "Hygiene and eugenics should go hand in hand," writes Fisher. "They are really both hygiene . . . and, both, eugenics" ([1921] 1997 XIII: 185).

49. [1921] 1997, vol. XIII: 185. There is more in this article, "Impending Problems of Eugenics," on the theme of "misapplied hygiene": see 185–186.

50. See the texts collected in Chapters III and IV of Volume XIII of the *Works*: "Promoting Personal Health and the Extension of Life" and "Crusading Against Alcohol."

51. See Fisher's *National Vitality, Its Waste and Conservation* ([1909] 1976: 657).

52. In a letter to Will Eliott, December 10, 1909, quoted in Aldrich (1975: 37).

53. "To repeat this striking fact in other words: With the coming of Prohibition, wages suddenly rose from their old level, which they kept without much change for over a quarter of a century, to a new level where it now is a third higher than the old" (Fisher [1926a] 1997, vol. VIII: 127).

54. Connecticut in 1896, Kansas in 1903, New Jersey and Ohio in 1904, Michigan and Indiana in 1905: as a whole, 30 states between 1896 and 1930. See (Haller 1984: 47–48); and Hofstadter (1945: 139).

55. Irving Fisher and Eugene Lyman Fisk (1915: 321–322). *How to Live:*

Rules for Healthful Living Based on Modern Science was written by Fisher in 1915 with physician Eugene Lyman Fisk, well known for his positions in favor of eugenics. Fisk co-authored the first 19 editions and was replaced for the 20th edition (1938) and for the 21st edition (1946) by another physician, Haven Emerson. See Fisher, *Works*, XIII: 81.

56. The first published recommendation of sterilization for criminal activity was made in 1887 by a superintendant of the Cincinnati Sanitarium. The measure was described as (1) a punishment; (2) a way of helping criminals to control their proclivities; and (3) a way of preventing the propagation of inherited criminal tendancies. After some legislative battles, the first law permitting involuntary sterilization was enacted in Indiana in 1907. According to Mike Hawkins, "by 1933, twenty-nine other states had followed suit, although three states had by then repealed their acts" (Hawkins 1997: 242). As a result, during the first six decades of the 20th century, more than 60,000 mentally ill or mentally retarded individuals were sterilized for eugenic reasons (Reilly 1991: xiii). See also Degler (1991: 45); Haller (1984: 136–141); and Hofstadter (1945: 139).

57. Fisher, "Membership Pledge of the Life Extension Institute" ([1915d] 1997, vol. XIII: 80).

58. See also the address Fisher delivered at Vassar College on the day the United States entered the war, April 7, 1917: "[T]o those of us who had been interested in race hygiene or eugenics, the greatest tragedy was the destruction of the best manhood of Europe, those who ought to be the parents of future generations" ([1917a] 1997, vol. XIII: 82).

59. See also his 1888 series of three articles on "The Control of Immigration" in the *Political Science Quarterly*.

60. *A Eugenic Catechism* (1928), quoted in Kevles (1985: 95).

61. Fisher to Charles B. Davenport, March 12, 1912. Davenport Papers, American Philosophical Society Library, quoted in Fisher, *Works*, XIII: 161. The same Galtonian reference to religion is quoted *supra*, in Fisher's 1921 presidental address to the Eugenics Research Association.

62. On these classical forms of disciplinary transfers, see Cohen's very clear contribution to *The Natural Sciences and the Social Sciences: Some Critical and Historical Perspectives* (1991: 5–29).

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